

-8-

REMARKS

In response to the Office Action mailed April 12, 2006, the Applicants respectfully request reconsideration. To further the prosecution of this Application, the Applicants submit the following remarks, have canceled claims and have added new claims. The claims as now presented are believed to be in allowable condition.

Claims 1-9, 12-20, 22-23, 31, 33, and 35 were pending in this Application. By this Amendment, claim 33 has been cancelled. The Applicants expressly reserve the right to prosecute at least some of the cancelled claims and similar claims in one or more related Applications. Claim 36 has been added. Accordingly, claims 1-9, 12-20, 22-23, 31, 35, and 36 are now pending in this Application. Claim 35 is an independent claim.

Rejections under 35 U.S.C. §112

Claims 1-9, 12-20, 22-23, 31, 33, and 35 were rejected under 35 U.S.C. §112, first paragraph. The Office Action contends, on page 2, that the specification does not reasonably provide for two different RAIDs across ALL of device 106, and traditional disks 100a, 100n at the same time (e.g., "2 RAIDs on all of the disks at the same time"). The Applicants respectfully traverse this rejection.

Regarding the applicability of the rejection, it is unclear which of claims 1-9, 12-20, 22-23, 31, or 35 recite the use of "2 RAIDs on all of the disks at the same time" as asserted by the Office Action. For example, claim 35 recites first-tier RAID control circuitry and second-tier RAID control circuitry. As claimed, the first-tier RAID control circuitry is configured to apply a first RAID scheme on the set of storage devices in a manner that treats the set of storage devices as a first array under application of the first RAID scheme. Also as claimed, the second-

-9-

tier RAID control circuitry is configured to apply a second RAID scheme on a set of storage sub-devices of a storage device of the set of storage devices in a manner that treats the set of storage sub-devices of that storage device as a second array under application of the second RAID scheme. Claim 35 does not specifically recite "2 RAIDS on all of the disks at the same time" or the use of different RAIDs across ALL of device 106, and traditional disks 100a, 100n at the same time. If the rejection of independent claim 35 and dependent claims 1-9, 12-20, 22-23 and 31 is to be maintained, the Applicants respectfully request that it be pointed out with particularity where the claims recite "2 RAIDS on all of the disks at the same time" as asserted by the Office Action.

Claims 1-9, 12-20, 22-23, 31, and 35 were rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention.

On page 3, the Office Action indicates that lines 13-14 of claim 35 recite each storage device having multiple small form factor magnetic disk drives and recites lines 15-16 reciting *the* storage device having multiple small form factor magnetic disk drives. The Applicants respectfully traverse this rejection. Claims 1-9, 12-20, 22-23, 31, and 35 are unambiguous.

While lines 13 and 14 recite "each storage device of the set of storage devices has at least one magnetic disk drive" the Applicants disagree with the Office Action's assessment of lines 15-16. Lines 15-16 actually recite "wherein the storage device *having the set of storage sub-devices includes, as the storage sub-devices*, multiple small form factor magnetic disk drives" (emphasis added). Taken in this light, there is no confusion between "each storage device of the set of storage devices" and "the storage device *having the set of storage sub-*

-10-

devices” as recited in the claim. As such, the Applicants respectfully request that the rejection be withdrawn.

Also on page 3, the Office Action indicates that line 7 of claim 35 recites “the array” and indicates that it is unclear which array the Applicants are referring to. The Applicants have amended claim 35 to provide proper antecedent basis between the “the array” in line 7 of claim 35 as originally claimed and “a first array” as recited *supra*. The amendment does not add new matter to the application and does not raise new issues requiring further search and consideration. The Applicants respectfully request that the rejection be withdrawn.

Rejections under 35 U.S.C. §103

Claims 1-7, 12-20, 22-23, 31, and 35 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,805,787 to Brant et al. (hereinafter Brant) in view of “The RAID Book,” 6th Edition (hereinafter RAID Book). Claims 8 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brant in view of the RAID Book and further in view of U.S. Patent No. 6,078,498 to Eckerd et al. (hereinafter Eckerd).

The Applicants respectfully traverse each of these rejections and request reconsideration. The claims are in allowable condition.

Claim 35 recites a data storage system comprising a set of storage devices, first-tier RAID control circuitry coupled to the set of storage devices, and second-tier RAID control circuitry coupled to the array of storage devices. Each storage device is configured to store and retrieve data in response to data access commands from a set of external host computers. The first-tier RAID

-11-

control circuitry is configured to apply a first RAID scheme on the set of storage devices in a manner that treats the set of storage devices as a first array under application of the first RAID scheme. The second-tier RAID control circuitry is configured to apply a second RAID scheme on a set of storage sub-devices of a storage device of the set of storage devices in a manner that treats the set of storage sub-devices of that storage device as a second array under application of the second RAID scheme. Each storage device of the set of storage devices has at least one magnetic disk drive. The storage device having the set of storage sub-devices includes, as the storage sub-devices, multiple small form factor magnetic disk drives. The first-tier RAID control circuitry is adapted to treat each storage device of the set of storage devices as exactly one RAID device when applying the first RAID scheme to store particular data in the set of storage devices. The second-tier RAID control circuitry is adapted to treat each storage sub-device of the set of storage sub-devices as exactly one RAID device when applying the second RAID scheme to store a portion of the particular data in the set of storage sub-devices in order to store the particular data in a RAID-within-RAID manner.

Brant relates to data processing structures and procedures which provide interfacing between computer type systems and low cost but slow performing mass data storage devices or subsystems. Brant includes a disk based cache 16 having six small disk drives 53-58 and a host that interfaces with the disk based cache. As indicated in Brant, smaller form factor disk drives permit disk subsystems to exploit the performance advantages of having more disk drives to service requests in parallel (column 1, lines 42-45).

The Office Action indicates that limitations of the claim that are interpreted to be the RAID-within-a-RAID system disclosed in part in the instant specification at pages 9 and 11 are not explicitly disclosed by Brant. While the Office Action

-12-

does not specifically point out any particular claim elements interpreted to be the RAID-within-a-RAID system, the Applicants interpret the Office Action to mean that Brant does not teach or disclose the first-tier RAID control circuitry being adapted to treat each storage device of the set of storage devices as exactly one RAID device when applying the first RAID scheme to store particular data in the set of storage device and the second-tier RAID control circuitry being adapted to treat each storage sub-device of the set of storage sub-devices as exactly one RAID device when applying the second RAID scheme to store a portion of the particular data in the set of storage sub-devices in order to store the particular data in a RAID-within-RAID manner, as claimed by the Applicants.

The Office Action relies on the RAID Book to provide such a teaching. However, the RAID Book does not cure the deficiencies of Brant.

The RAID Book is a storage system technology handbook. Page 39 of the RAID Book recites that

the RAID Advisory board defines disk arrays in terms of data mapping (between virtual disk block addresses and member disk block addresses) only, and specifically excludes characteristics such as disk system or controller affinity, and hardware and interface type. In consequence of this definition: a single disk system can contain multiple disk arrays, or, disks attached to multiple disks systems can be members of a single (host based) array.

In a footnote related to this quote, the RAID Book recites that

the ANSI X3T10 SCSI-3 Controller Command Specification's definition allows even greater flexibility - arrays may have members that are themselves arrays. This feature has not appeared in products as yet, and the RAID Advisory Board has yet to define terminology for describing it.

While the RAID Book recites that "arrays may have members that are themselves arrays", the RAID Book does not teach or suggest the way in which

-13-

“the members that are themselves arrays” are treated and used. Specifically, the RAID Book does not teach or suggest a second-tier RAID control circuitry being adapted to treat each storage sub-device of the set of storage sub-devices as exactly one RAID device when applying the second RAID scheme to store a portion of the particular data in the set of storage sub-devices. The RAID Book is silent as to how “the members that are themselves arrays” are treated. In fact, with respect to “the members that are themselves arrays”, the RAID Book recites that the feature has not appeared in products as yet and the RAID Advisory Board has yet to define terminology for describing it.

For the reasons stated above, claim 35 patentably distinguishes over the cited prior art, and the rejection of claim 35 under 35 U.S.C. §103(a) should be withdrawn. Accordingly, claim 35 is in allowable condition. Because claims 1-7, 12-20, 22-23, and 31 depend from and further limit claim 35, claims 1-7, 12-20, 22-23, and 31 are in allowable condition for at least the same reasons.

Newly Added Claims

Claim 36 has been added and is believed to be in allowable condition. Claim 36 depends from claim 35. Support for claim 36 is provided within the Specification, for example, on page 8, line 20 through page 9, line 17. No new matter has been added.

-14-

Conclusion

In view of the foregoing remarks, this Application should be in condition for allowance. A Notice to this affect is respectfully requested. If the Examiner believes, after this Amendment, that the Application is not in condition for allowance, the Examiner is respectfully requested to call the Applicant(s)' Representative at the number below.

The Applicants hereby petition for any extension of time which is required to maintain the pendency of this case. If there is a fee occasioned by this Amendment, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50-3661.

If the enclosed papers or fees are considered incomplete, the Patent Office is respectfully requested to contact the undersigned collect at (508) 616-2900, in Westborough, Massachusetts.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Jeffrey J. Duquette", is written over a horizontal line.

Jeffrey J. Duquette, Esq.
Attorney for Applicant
Registration No.: 45,487
Bainwood, Huang & Associates, L.L.C.
Highpoint Center
2 Connector Road
Westborough, Massachusetts 01581
Telephone: (508) 616-2900
Facsimile: (508) 366-4688

Attorney Docket No.: EMC04-48

Dated: July 12, 2006